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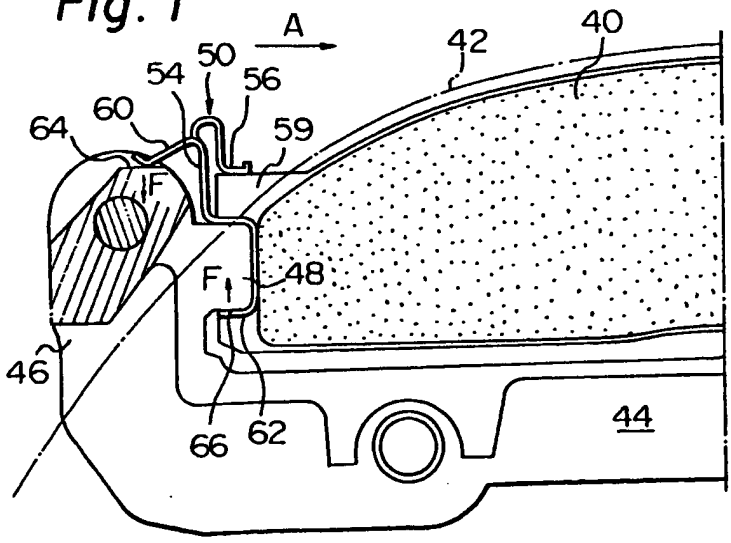
Selected US specifications from IPC sub-class F16D

(54) Disc brake

(57) A disc brake comprises a pair of pads (40) positioned on opposite sides of a rotatable disc (42), a carrier (44) having a pair of arms (46) which are apart from each other in the circumferential direction of the disc and each of which straddles the outer periphery of the disc from one side to the other side of the periphery so as to carry the pads in such a manner that the pads are slidably guided in the axial direction of the disc towards and away from the disc, and a pair of pad springs (50) positioned between the pads and the respective arms such as to urge the pads against the arms of the carrier to eliminate the play between the pads and the arms. Each pad spring has a body portion (54) and first and second portions (60,62) extending towards the adjacent arm (46) such as to resiliently clamp the arm. The surfaces 64,66 of the carrier (44) engaged by the spring portions (60,62) are parallel to one another or diverge in a direction towards the pad (40) so as not to apply to the pad spring (50) any force in the direction "A" which would tend to dislodge the pad spring before the pads are fitted.

Fig. 1



The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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Fig. 1

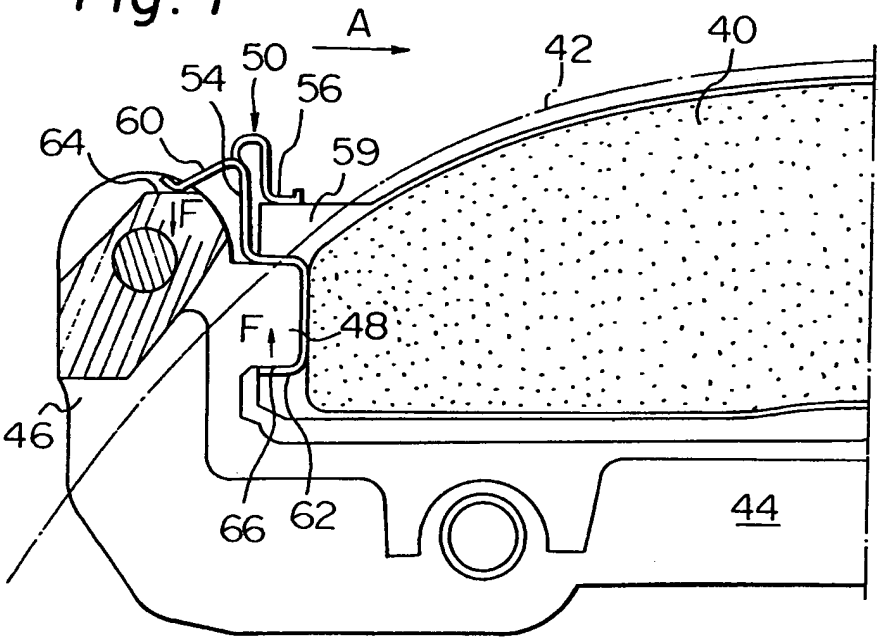
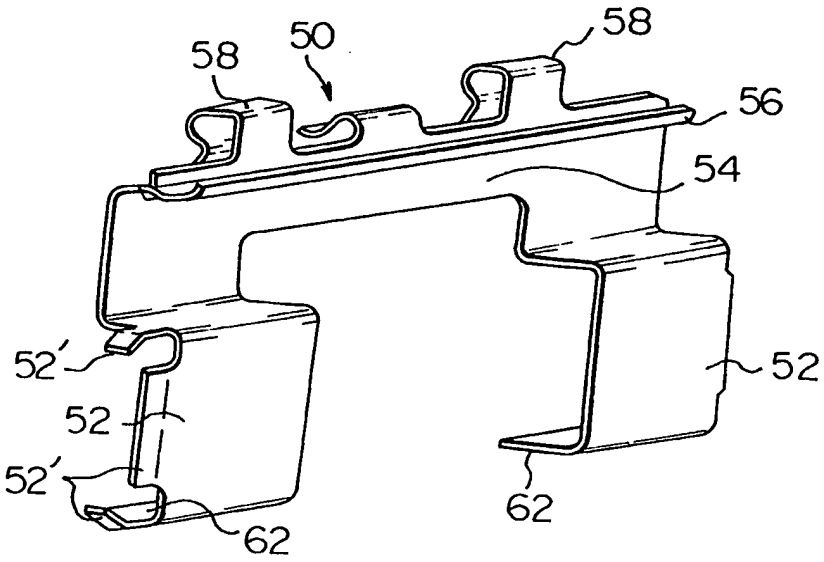


Fig. 2



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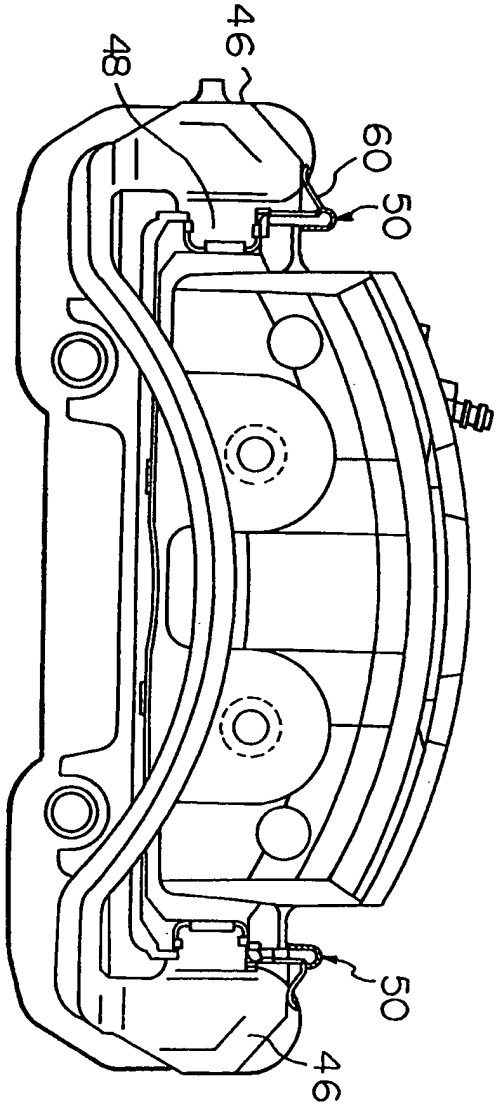

Fig. 3

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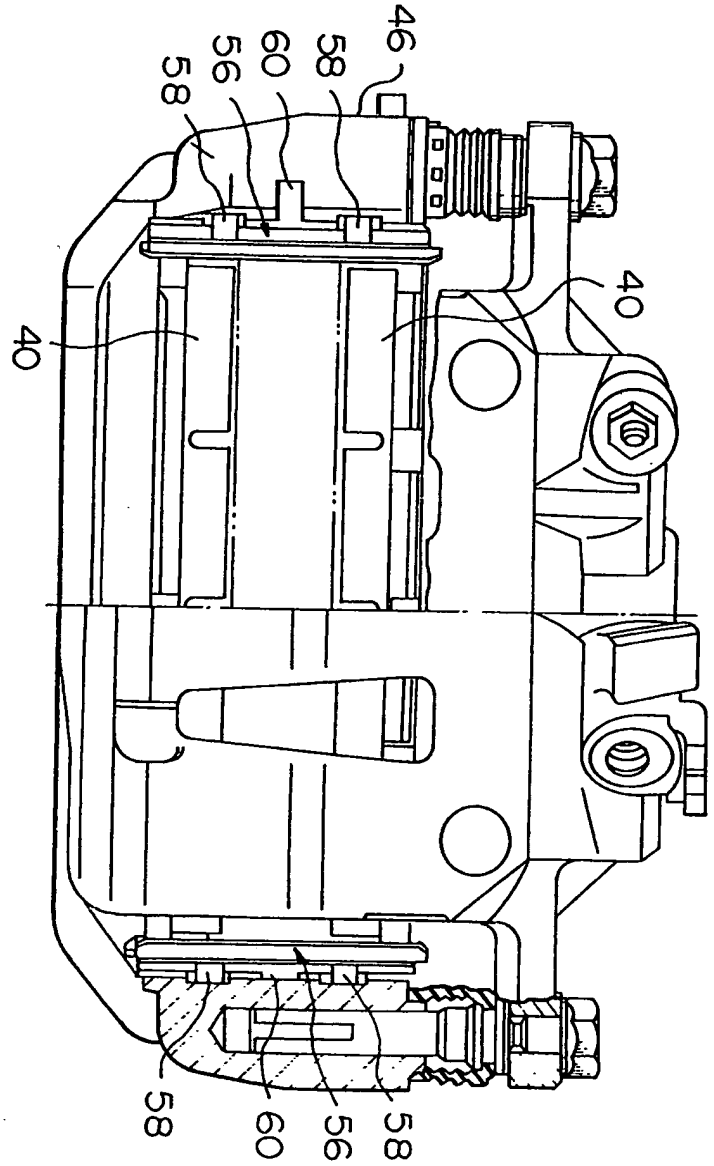

Fig. 4

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Fig. 5

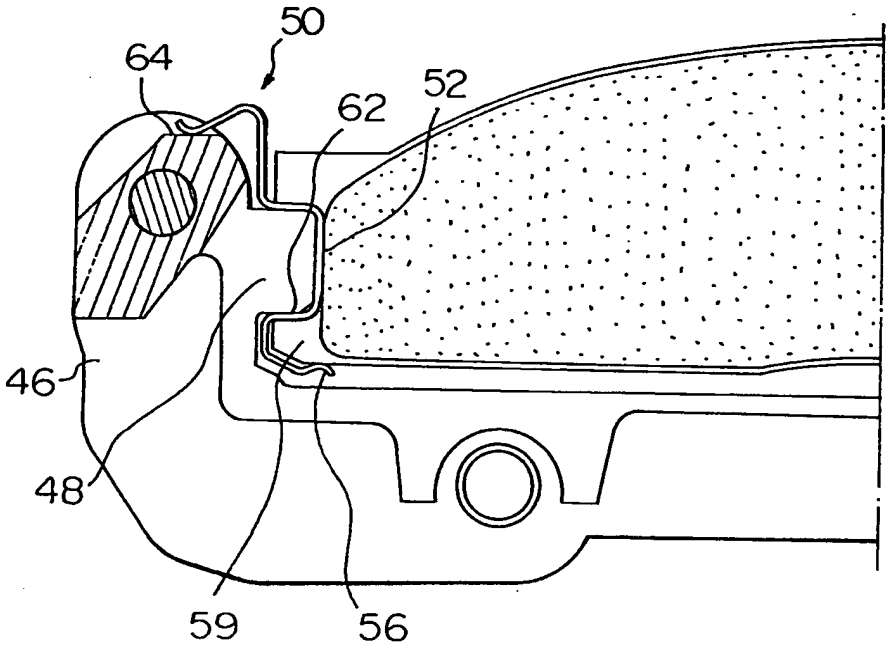

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Fig. 6

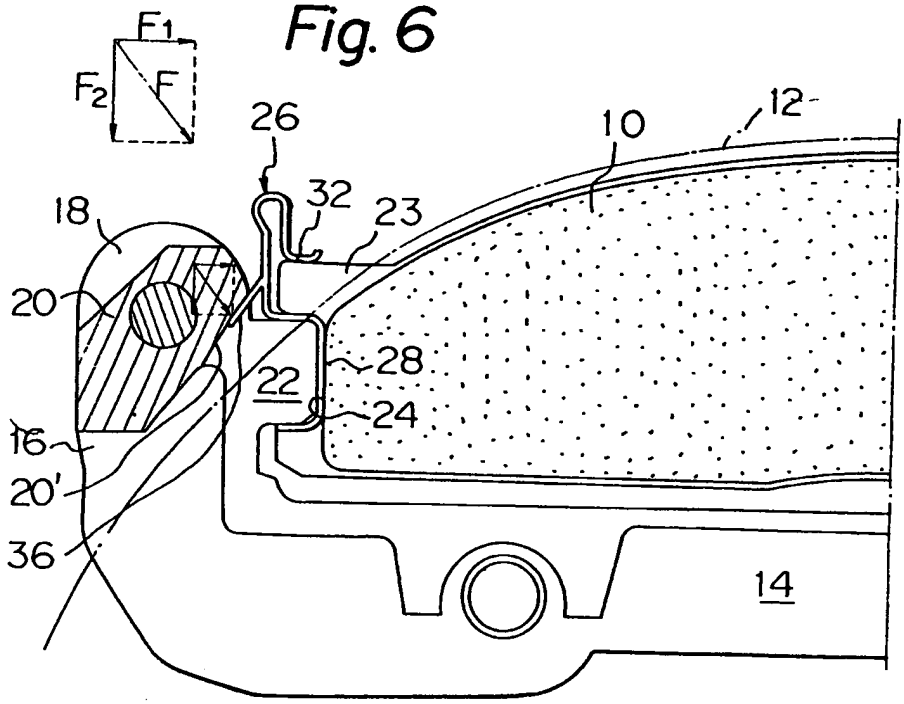
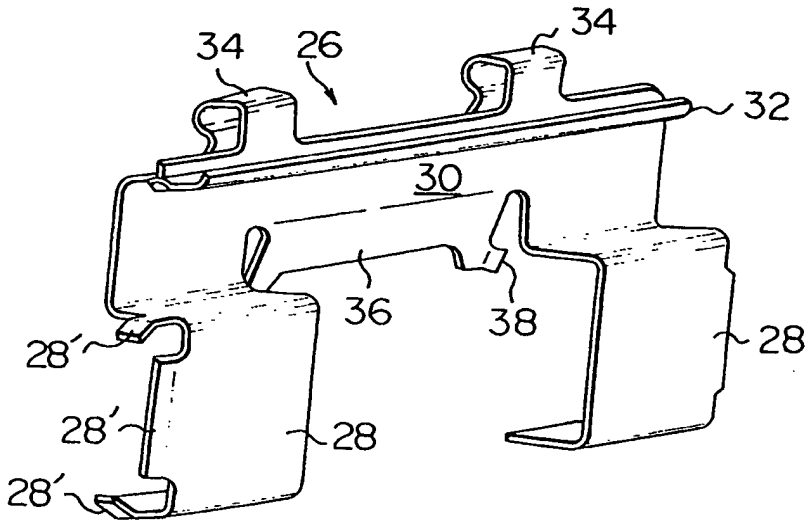


Fig. 7



SPECIFICATION

Disc brake

This invention relates to disc brakes.

A typical prior art disc brake will first be explained with reference to Figs. 6 and 7 of the accompanying drawings. Fig.6 is a sectional view of one half of a typical prior art disc brake viewing the half part in the axial direction of a rotatable disc and Fig.7 is a perspective view of a pad spring used in the disc brake shown in Fig.7.

As shown in Fig.6, a typical prior art disc brake includes a pair of pads 10 (only a part of one being shown) positioned on opposite sides of a rotatable disc 12 and a carrier 14 which is adapted to be secured to a stationary part (not shown) of a vehicle. The carrier includes a pair of arms 16 (only one being shown) which are spaced apart from each other in the circumferential direction of the disc. Each arm 16 includes a pair of pad-carrying portions 18 (only one being shown) positioned on opposite sides of the outer periphery of the disc and a bridging portion 20 passing over the outer periphery and interconnecting both pad-carrying portions 18 of the arm 16. The respective pad-carrying portions of each arm 16 are provided with pad guide portions or guide rails 22 on the surfaces thereof which are opposed to the corresponding surfaces of the respective pad-carrying portions of the other arm. The guide rails 22 are adapted to be engaged with recesses 24 provided in the side edges of back plates 23 of the pads 10 so that the guide rails 22 guide the pads in the axial direction of the disc 12 towards and away from the disc. Between the arms 16 and the pads are provided a pair of pad springs 26 (only one being shown) which are preferably made of sheet metal, such as stainless steel. Each pad spring includes, as shown in Fig.7, a pair of leg portions 28 which are, as viewed in Fig.6, formed in the shape of a reversed "C" with the leg portions being received about the guide rails 22, and a base portion 30 interconnecting the leg portions. Inclined projections or tabs 28' provided on the outer edges of the respective leg portions 28 engage the outer edges of the corresponding guide rails in the axial direction of the disc so as to prevent the pad spring from moving in the axial direction. The pad spring 26 further includes a pressure portion 32 which is connected to the base portion 30 by a pair of connecting portions 34, the pressure portion 32 being adapted to engage the outer surface of the pad plate 23 and resiliently press the pad plate against the guide rail 22 with the interposition of the leg portions 28 of the pad spring 26 so as to eliminate play between the pad 10 and the guide rail 22. Furthermore, the spring 26 includes a retaining portion 36 projecting from the base portion 30 and remote from the pressure portion 32. The retaining portion 36 is adapted to be used to retain the pad spring 26 on the arm 16 of the carrier in such a manner as is shown in Fig.6 at the pad spring mounting station and then the pads 10 are mounted on the pad with the pad springs at the pad mounting station. At the pad spring mounting station, the retaining portion 36 is inserted between the pad-carrying portions 18 and underneath the bridging portion 20 in such a manner that claws 38 provided at ends of the retaining portion 36 engage the inner or opposite surfaces of the pad-carrying portions 18 and the retaining portion 36 itself is resiliently depressed by the inclined under surface 20' of the bridging portion 20 of the arm 16 so that the pad spring 26 is retained in the position shown in Fig.6 by the engagement of the claws 38 with the pad-carrying portions 18 and a depressing force F until the carrier with the pad springs reaches the pad mounting station. However, the depressing force F stated above tends to act unfavourably with respect to the retaining force of the spring 26. That is, since the depressing force F applied by the inclined under surface of the bridging portion 20 of the carrier 14 has a component F1 directed towards the pad 10, the pad springs 26 are apt to become dislodged and to be moved towards each other during the transfer of the carrier 14 with the pad springs from the pad spring mounting station to the pad mounting station, so that the space between the pad springs 26 mounted on the arms 18 decreases and thus the mounting operation of the pads becomes difficult.

Accordingly, an object of this invention is to provide a disc brake with improved pad springs which reduce or eliminate the defect or problem of the prior art disc brake stated above.

A disc brake, according to the present invention, includes a pair of pads positioned on opposite sides of a rotatable disc; a carrier adapted to be secured to a non-rotatable part of a vehicle, the carrier having a pair of arms which are spaced apart from each other in the circumferential direction of said rotatable disc and each of which straddles the outer periphery of the disc from one side to the other side of the disc periphery, the arms each having pad guide portions adapted to slidably guide said pads in the axial direction of the disc; and pad springs provided between each of the pads and the respective guide portions and adapted to urge the pads against the guide portions; each pad spring including first and second retaining portions adapted to resiliently engage a pair of surfaces of said carrier in such a manner that the first and second portions resiliently clamp the carrier such as to hold the pad spring on the carrier, the surfaces of the carrier being substantially normal

to the plane of said disc.

Preferably, the surfaces of the arm are substantially normal to the plane of said disc and, as viewed in the axial direction of the disc, do not converge towards the body portion of the pad spring.

In a preferable embodiment, the surfaces of the arm which are engaged by the first and second portions of the pad spring are substantially parallel to each other.

As noted from the above, in the assembly process of the disc brake in accordance with this invention, the pad spring which has been mounted on the arm of the carrier at the pad spring mounting station can be retained in the position in which the spring is initially mounted at that station by the clamping force caused by the first and second portions which does not create any reaction force which would be exerted on the pad spring and which would include a component directed towards the space wherein the pad will be mounted until the carrier with the pad springs reaches the pad mounting station.

The invention will be further described, by way of example, with reference to the accompanying drawings, in which:

Fig.1 is a sectional view of one half of a disc brake in accordance with a first embodiment of the present invention, viewing the half part in the axial direction of a rotatable disc;

Fig.2 is a perspective view of a pad spring used in the disc brake shown in Fig.1;

Fig.3 is a view of the first embodiment of disc brake, viewing the brake in the axial direction of the disc;

Fig.4 is a side elevational view of the disc brake shown in Fig.3, viewing the brake in the direction normal to the axial direction of the disc;

Fig.5 is a sectional view of one half of a disc brake in accordance with a second embodiment of the present invention; and

Figs. 6 and 7 illustrate a prior art disc brake and have already been described.

As shown in Fig.1, a disc brake in accordance with the first embodiment of the present invention includes elements which are substantially equivalent to those of the prior art disc brake shown in Fig.6 and explained above, i.e., a pair of pads (only one being shown) 40 positioned on opposite sides of a rotatable disc 42, a carrier 44 including a pair of arms 46 (only one being shown) which are spaced apart from each other in the circumferential direction of the disc 42 and each of which straddles the outer periphery of the disc from one side thereof to the other, the arms having pad guide rails 48 provided on the opposite surfaces of the arms 46 which are opposed to each other and adapted to slidably guide the pads 40 in the axial direction of the disc, and pad springs 50 (only one being shown) provided between each of the pads 40 and the guide rails 48 and adapted to urge the pads 40 against the guide rails 48 with the spring 50 interposed therebetween so as to eliminate play between the guide rails and the pads. As shown in Fig.2, the pad spring 50 of the brake according to the preferred embodiment of the invention, includes a pair of leg portions 52, a base portion 54 interconnecting the leg portions 52 and a pressure portion 56 connected to the base portion 54 by a pair of connecting portions 58. These portions of the pad spring 50 are substantially the same as the corresponding portions of the aforementioned prior art disc brake in configuration and function. That is, the leg portions 52 are of a configuration corresponding to that of the guide rails so that the leg portions are received about the guide rails 48 and the pressure portion 56 is adapted to resiliently engage the outer surface of the back plate 59 of the pad 40 so as to urge the pad back plate with the pad against the guide rail 48 with the interposition of the pad spring between the pad plate and the guide rail 48. Inclined projections 52' provided on the outer edges of the respective leg portions 52 are adapted to engage the outer edges of the guide rails 48 in the axial direction of the disc so as to prevent the pad spring 50 from moving in that direction. Contrary to the embodiment of Fig.7, the pad spring 50 has a retaining portion 60 which projects from the base portion 54 away from the pressure portion 56. The retaining portion 60 is adapted to resiliently engage the outer surface 64 of the arm 46 which faces away from the disc 42 in the radial direction of the disc so that the pad spring resiliently clamps the arm 46 of the carrier 44 by the retaining portion 60 and the tip end retaining portions 62 of the leg portions 52 which engages the surfaces 66 of the guide rails 48 facing the disc and thus the pad spring is in turn retained in the position shown in Fig.1. Since surface 64 of the arm 46 and the surface 62 of the guide rail 48 are substantially parallel to each other, there are no forces or factors which act on the pad spring 50 in such a manner that the spring 50 would be moved away from the adjacent arm in the direction designated by arrow "A". In this connection, it should be noted that it is important that the surfaces 64 and 66 do not, as viewed in the axial direction of the disc 42, converge towards the pad spring, in order to prevent the creation of the forces or factors which would tend to move the pad spring towards the space stated above, in other words, in order to prevent the pad spring from slipping off the arm towards that space. That is, the surfaces 64 and 66 should be substantially parallel to each other as in this embodiment or converge away from the adjacent pad spring.

As will be noted from the above explanation, since in the assembly process of the disc brake of the present invention, the pad

springs which have been mounted on the arms of the carrier 44 at the pad spring mounting station can be retained in the predetermined position on the arms until the carrier 44 reaches the next station, i.e, the pad mounting station, any decrease in the space between the pad springs which might otherwise occur during the transfer of the carrier with the pad springs from the pad spring mounting station to the pad mounting station such as to render the mounting operation of the pads difficult can be advantageously avoided.

Fig.5 shows a disc brake of the second embodiment of the present invention. In Fig.5, the elements of the disc brake are assigned the same reference numbers as those of the corresponding elements in the first embodiment. The disc brake is substantially the same as that of the first embodiment except for the following minor change applied to the pad spring 50. That is, the pressure portion 56 is connected to the tip ends 62 of the leg portions 52. The pressure portion 56 resiliently engages the inner side surface of the pad back plate 59 and urges the back plate against the guide rails 48 with the interposition of the leg portions 52 of the pad spring so as to eliminate play between the pad back plate and the guide rails.

CLAIMS

1. A disc brake including: a pair of pads positioned on opposite sides of a rotatable disc; a carrier adapted to be secured to a non-rotatable part of a vehicle, the carrier having a pair of arms which are spaced apart from each other in the circumferential direction of said rotatable disc and each of which straddles the outer periphery of the disc from one side to the other side of the disc periphery, the arms each having pad guide portions adapted to slidably guide said pads in the axial direction of the disc; and pad springs provided between each of the pads and the respective guide portions and adapted to urge the pads against the guide portions; each pad spring including first and second retaining portions adapted to resiliently engage a pair of surfaces of said carrier in such a manner that the first and second portions resiliently clamp the carrier such as to hold the pad spring on the carrier, the surfaces of the carrier being substantially normal to the plane of said disc.

2. A disc brake as claimed in claim 1, in which said surfaces of the carrier for each pad spring are substantially parallel to each other.

3. A disc brake as claimed in claim 1, in which said surfaces of the carrier from each pad spring converge in a direction away from the adjacent pad spring.

4. A disc brake as claimed in claim 2 or 3, in which one of said surfaces of the carrier for each pad spring is the outer surface remote from said disc and the other surface of said carrier is the surface of said guide portion which faces said disc.

5. A disc brake as claimed in claim 4, in which each of said pad springs includes a pair of leg portions which are positioned on the opposite sides of the periphery of the rotatable disc and adapted to engage said pad guide portions of the respective arm, a connecting portion passing over the periphery of the disc and interconnecting the pair of leg portions, and a retaining portion projecting from the edge of the connecting portion opposite the edge to which said leg portions are connected, the tip end portions of said leg portions and the retaining portion being adapted to resiliently engage said one surface of the carrier and the other surface of the same, respectively.

6. A disc brake as claimed in any preceding claim, in which said pad guide portions of said arms comprise guide rails and the pad back plates have notches in which the guide rails are received.

7. A disc brake, constructed and adapted to operate substantially as herein described with reference to and as illustrated in the accompanying drawings.

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